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October 25, 2007 ***Ex Parte Notice***

Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: In the Matter of Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum and Adopt Service Rules and Procedures to Govern the Use of Vehicle-Mounted Earth Stations in Certain Frequency Bands Allocated to the Fixed-Satellite Service (IB Docket No. 07-101)

Dear Ms. Dortch:

On October 23, 2007, Tim Shroyer, Chief Technical Officer of General Dynamics C4 Systems, Philip L. Verveer and the undersigned, counsel for General Dynamics Corporation, conducted a demonstration of General Dynamics SATCOM Technologies' Satcom-On-The-Move™ system at the Federal Communications Commission with various representatives from the International Bureau and the Office of Engineering and Technology. The demonstration included a close examination of the antenna and RF equipment with the radome removed so antenna tracking could be observed. Test rides were also provided to FCC personnel interested in observing the real world effects of signal blockage and other environmental factors on the Vehicle-Mounted Earth Station's performance. The parties distributed or discussed the attached materials during the demonstration.

Should you have any questions regarding this matter, please do not hesitate to contact the undersigned.

Respectfully submitted,

/s/

McLean Sieverding
Counsel for General Dynamics Corporation

cc: Balatan, Jennifer
Collins, Kathleen
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Fleming, Chip
Garfield, Diane
Ghavami, Shahnaz
Griboff, Howard
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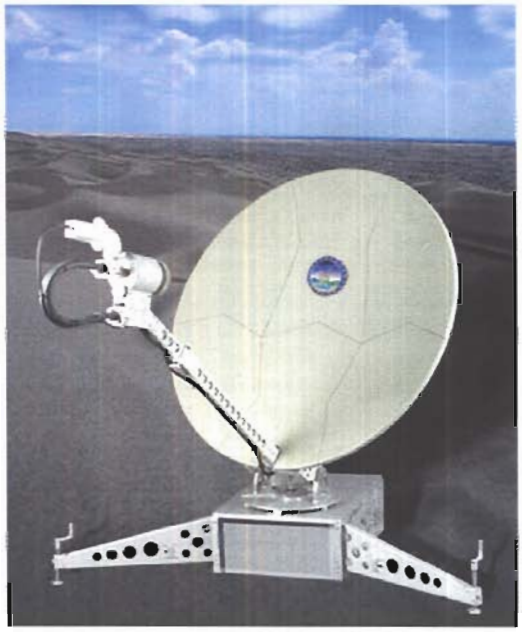
Prime, Jamison
Roberts, Alyssa
Spaeth, Steven
Whaley, Jay
Wong, John

Vertex RSI

Warrior™ Model 100 WIP-T Satcom Terminal



Key Features

- Ultra portable 1.0M terminal in two ergonomically-designed backpacks that meet airline check-in requirements
- 4, 8, 15W BUC/SSPA
- **Up to 4.0Mbps transmit and receive operation***
- Auto-acquisition controller with highly intuitive Graphical User Interface
- SIPRNET and NIPRNET access
- Supports standard IP applications (Internet, VoIP, email, streaming video, etc.)
- Internal iDirect iNFINITI or Paradise modem
- **Designed for harsh and hostile environments**
- Built-in spectrum analyzer, beacon/carrier detector and DVB carrier recognition

*Satellite, Modem & BUC/SSPA dependent

Applications

- Command and Control Reachback and Range Extension at unit level or higher
- Disaster Support
- Special Forces
- First Responders
- Search and Rescue
- Mobile Border Checkpoints

Description

General Dynamics' Model 100 *Warrior I.P.-Terminal* (WIP-T), 1.0M flyaway SATCOM terminal is equipped to handle any Internet Protocol (IP) application and provide secure or non-secure communications over Ku-band (future Ka-band). A member of the Warrior™ family of tactical SATCOM terminals, the Model 100, 1.0M flyaway terminal can deliver Broadband, IP-based, two-way connectivity in the most rugged tactical environment.

Complete in its backpack cases, the Warrior Model 100, 1.0M terminal is easily transportable and ready for immediate use. With the aid of the Auto-acquire feature, the terminal can be assembled and made operational (satellite acquired) by unit-level troops in less than 30 minutes. Modular in design, the General Dynamics Model 100 terminal can accommodate any number of Block Up Converters, Amplifiers, and Modem configurations. Complete terminal control is accomplished with the aid of the internal Monitor and Control (M&C) system which runs from any PC with Windows, requiring no software to be installed.

Designed to support Network Centric Operations, the Model 100, 1.0M Terminal can access any IP-Network for which it is authorized. Fast and reliable, the WIP-T Model 100 can transmit at IP data rates of 4.0Mbps and receive data at 18.0Mbps. From real time video to large data files, the Model 100, 1.0M is an ideal flyaway SATCOM terminal for the most demanding Command and Control requirements.

Vertex RSI

Warrior™ Model 100 WIP-T Satcom Terminal

General Specifications

System Performance	Receive	Transmit
Frequency (GHz)	10.95-12.75	14.00-14.5
EIRP: w/ 4W BUC w/ 8W BUC w/ 15W BUC	46.2 dBW @ 1 dBc 49.2 dBW @ 1 dBc 52.0 dBW @ 1 dBc	
G/T (NT sky 50K)	19.4 dB/°K	
TX Radiation Pattern Compliance	FCC §25.209, ITU-R S.528.5	
Shock/Vibration	Designed to meet MIL-STD-810F	
Operating Temperature	-30°C to +50°C	
Wind: Operational Survival	60 km/h 100 km/h	
Backpack Cases Cases 1 and 2	Weight ~55 lbs. each	Dimensions 495 x 685 x 335 mm each
Antenna Controller	Fully-automatic satellite acquisition, peaking and cross-pol adjustment using GPS, compass, and level sensor inputs	
Operator Interface	10/100Base-T Ethernet	
Operating System	Windows XP Embedded	
Power	24 VDC (optional AC)	
Consumption	290W to 480W (varies with power source and SSPA size)	

RF Terminal	
Reflector	1.0 meter carbon fiber segmented (6)
Az/El/ Pol Drive System	Motorized elevation over azimuth mounted on baseband unit
Polarization Configuration	Linear Cross-pol, motorized resolution <0.25°
Azimuth Travel Elevation Travel	±190° motorized, resolution <0.1° 10° to 90°, motorized, resolution <0.1°

Modem	
Data Interface	10/100BaseT Ethernet x 2
Digital Data Rate	Up to 4 Mbps – modem dependent
Modulation	BPSK or OQPSK
Forward Error Correction	Viterbi, Sequential, Reed-Solomon and Turbo
L-Band Frequency Range Modes	950 to 1700 MHz TDMA (star or mesh) or SCPC

Optional Features

- Laptop or wired touchscreen display for operator interface
- Extended Ku-band (13.75-14.50 transmit)
- Portable battery power source

Backpack Cases

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Warrior™ Model 120 WIP-T Satcom Terminal

Key Features

- Sets up in less than 15 minutes
- Modular design allows for multiple configurations
- 4, 8, 16, 25 or 40W BUC/SSPA
- 18.0Mbps inbound and 4.0Mbps outbound operation*
- Transit case packaging (rugged yet lightweight)
- Shippable via commercial air cargo
- One button satellite auto-acquisitions
- Terminal controller with GUI
- Built-in spectrum analyzer
- SIPRNET and NIPRNET access options
- IP voice and data capability
- Cisco Router
- iDirect iNFINITI Modem (others available)

* Satellite, Modem, & BUC/SSPA dependent

Applications

- Command and Control Reachback and Range Extension at Unit level or higher
- LAN Access

Programs

- CSS
- WWSS
- WIN-T
- HC3
- SOF

Description

General Dynamics' Warrior™ product line of tactical SATCOM terminals delivers true, Broadband, Internet Protocol (IP)-based, two-way connectivity under the harshest conditions. The Model 120 *Warrior I.P.-Terminal* (WIP-T), 1.2M flyaway terminal provides secure or non-secure communications over Ku-band (future Ka-band) and is fully equipped to handle any IP application.

The Warrior Model 120, 1.2M Terminal is delivered complete and ready for immediate use in its three lightweight transit cases. With the aid of VertexRSI's Auto-acquire feature, the terminal can be assembled and made operational (satellite acquired) within 30-minutes by unit level troops. Designed for modularity, the General Dynamics Model 120 terminal can accommodate different size amplifiers and modem configurations, all controlled by the VertexRSI terminal controller GUI interface.

Because it can access any IP-Network for which it is authorized, the Model 120 WIP-T is ideally suited to support Network Centric Operations.

The WIP-T Model 120 is designed to support the most demanding Command and Control applications. Capable of transmitting IP data rates of 4.0Mbps and receiving data at 18.0Mbps, the WIP-T Model 120 flyaway terminal can support tactical communications applications ranging from real time video to the transmission and reception of large data files.

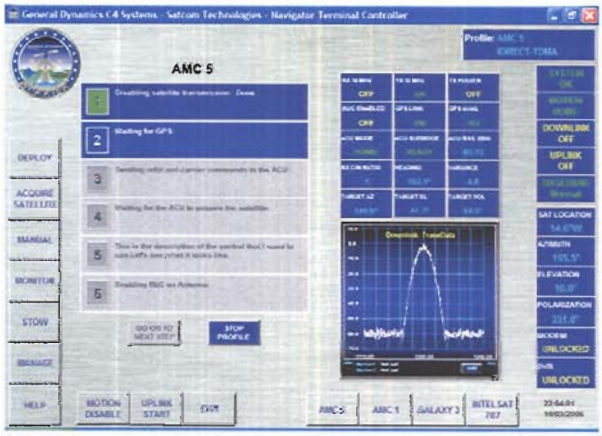
Warrior™ Model 120 WIP-T Satcom Terminal

General Specifications

Modem	
System Capabilities	
Data Interface	TCP/IP 10/100BaseT Ethernet
Digital Data Rate	64 kbps to 10.0 Mbps
Modulation	BPSK, QPSK, OQPSK
Forward Error Correction	Viterbi, Sequential, Reed-Solomon and Turbo
L-Band Frequency Range	950 to 1700 MHz

System Performance	Receive	Transmit
Frequency	10.95-12.75 GHz	14.00-14.5 GHz
EIRP: w/ 4W BUC w/ 8W BUC w/ 16W BUC w/ 25W BUC w/ 40W BUC	48.6 dBW @ 1 dBc 51.6 dBW @ 1 dBc 54.6 dBW @ 1 dBc 56.6 dBW @ 1 dBc 58.6 dBW @ 1 dBc	
G/T (@ 30° Elevation, midband	20.6 dB/°K	
Sidelobe Compliance	ITU-R S.528.5 FCC 25.220 (c) (1) (with max input power density of -15.3 dBw/4kHz)	
Receive Pointing Loss in Wind 10 mph (16 kph) 30 mph (48 kph) gusting to 45 mph (72 kph)	 0.8 dB peak 2.0 dB peak	
Wind: Operational (anchored) Survival (with tie downs) Survival (reflector panels removed)	30 mph (48 kph) gusting to 45 mph (72 kph) 50 mph (80 kph) 80 mph (129 kph)	

RF Terminal		
Antenna Optics	1.2 meter axis-symmetric	
Reflector Construction	Carbon fiber, 9-piece	
Feed Construction	Stepped-ring focus	
Az/El/ Pol Drive System	3-Axis Motorized Positioner	
Polarization Alignment	Rotation of feed	
Travel: Azimuth Elevation Polarization	 ±200° (2.5°/sec) 5° to 90° (2°/sec) ±50°	
Transit Containers	Weight	Dimensions
Case 1 Positioner	123 lbs.	42" x 23.5" x 23.5"
Case 2 Antenna/RF	81 lbs.	25" x 25" x 21.75"
Case 3 Electronics	101 lbs.	37" x 27" x 15"
Terminal Controller	• Fully-automatic satellite acquisition, peaking and cross-pol adjustment using GPS, compass, and level sensors inputs • Built-in spectrum analyzer • Modem control	
Operator Interface	GUI Interface via CFE computer	



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Warrior™ Model 180 WIP-T Multi-Band Satcom Terminal

Key Features

- Multi-band (C, X, Ku) with modular design
- Sets up in less than 30 minutes
- Operation in 30 mph winds gusting to 45 mph
- Lightweight (<800 lbs. with cases)
- Solid-state amplifiers for maximum reliability
- Standard L-band modem interface
- One button satellite auto-acquire
- Terminal controller with GUI
- Built-in spectrum analyzer

Applications

- Command Control Reachback and Range Extension at unit level or higher
- LAN access
- Voice, data and video

Programs

- WWSS
- WIN-T
- HC3
- SOF
- SPAWAR
- SWAN
- MiTT

Optional Features

- Optical IFL
- Full tracking controller
- Ka-band upgradable (with feed, SSPB, LNB)
- Various modems; iDirect, Viasat, Comtech, Radyne, Paradise, etc.
- IP or Serial Data
- SIPRNET and NIPRNET access

Description

The Warrior™ product line of tactical SATCOM terminals provides Broadband, IP based two way connectivity anywhere a flyaway can go. The Model 180 *Warrior I.P.-Terminal* (WIP-T), 1.8M terminal is equipped to handle any IP application and provide secure or non-secure communications over C, X or Ku bands.

The Warrior Model 180, 1.8M terminal comes ready for immediate use. With the Auto-acquire feature, a unit level troop can have the terminal up and operational within thirty minutes. The Model 180 terminal is designed for modularity which means it can accommodate any number of Block up converter/Amplifiers, Modem configurations along with the Monitor and Control (M&C) system.

The Model 180 WIP-T is designed for network centric operations, which means it can access any IP-Network it is authorized for. The WIP-T Model 180 is capable of IP data rates of 4.0Mbps outbound and 18.0Mbps inbound. The WIP-T Model 180 terminal is compatible with most content ranging from real time video to applications requiring the constant use of large data files which is typical use in the C2 environment.

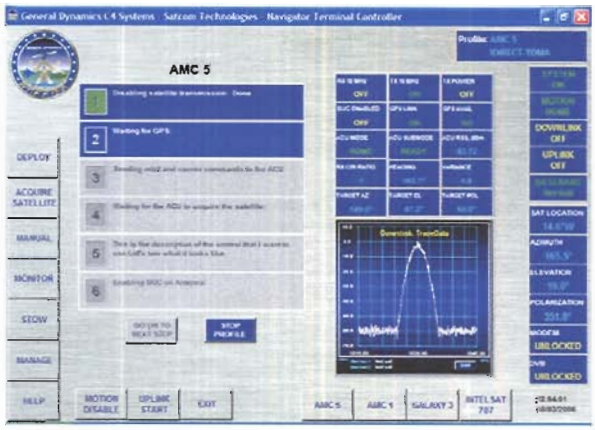
Warrior™ Model 180 WIP-T Multi-Band Satcom Terminal

General Specifications

Typical Modem	
System Capabilities	
Data Interface	TCP/IP 10/100BaseT Ethernet
Digital Data Rate	64 kbps to 10.0 Mbps
Modulation	BPSK, QPSK, OQPSK
Forward Error Correction	Viterbi, Sequential, Reed-Solomon and Turbo
L-Band Frequency Range	950 to 1700 MHz

System Performance	Receive	Transmit
Frequency Bands (GHz) C X Ku	 3.4-4.2 7.25-7.75 10.95-12.75	 5.85-6.65 7.9-8.4 13.75-14.5
EIRP: C-band X-band Ku-band	61 dBW @ 1 dBc 63 dBW @ 1 dBc 62.5 dBW @ 1 dBc	
G/T (@ 20° Elevation and lowest frequency) C-band X-band Ku-band	14.8 dB/°K 19.2 dB/°K 23.0 dB/°K	
TX Radiation Pattern Compliance	FCC §25.209, ITU-R S.528.5	
Receive Pointing Loss in 30-45 mph Winds	0.50 dB RMS (Ku-band)	
Wind: Operational Survival (deployed)	30 mph (48 kph) gusting to 45 mph (72 kph) 60 mph (96 kph) gusting to 70 mph (112 kph)	

RF Terminal	
Reflector	1.8 meter Offset Prime Focus (0.8 f/d)
Reflector Construction	Carbon Fiber segmented 9 piece
Az/El/ Pol Drive System	3-Axis Motorized Positioner
Travel: Azimuth Elevation Polarization	 +/- 110° 5° to 90° of Reflector Boresight Motorized ±95°
Package Types	Transit cases
Antenna Controller	• Fully-automatic satellite acquisition, peaking and cross-pol adjustment using GPS, compass, and level sensors inputs • Built-in spectrum analyzer • Modem control
Operator Interface	GUI Interface via CFE computer



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Warrior™ Model 240 Trailer Mounted SATCOM Terminal (TMST)

Key Features

- Next generation trailer offers X, Ku, Ka-band and Troposcatter operation on a single trailerized platform; C-band configurations also available
- Weighs less than 3900 lbs. fully loaded and wet
- Active compensation tracking eliminates outriggers - faster set up, smaller footprint and reduced structural weight
- Environmentally controlled equipment enclosure (part of U.S. Military NSN inventory), 2-bay up to 38 RUs with MRT (Master Reference Terminal) space or 4-bay up to 76 RUs
- Supports a wide variety of modems, multiple carriers and data rates from 4 Mbps up to 155 Mbps
- Terminal controller combines antenna control, M&C, tracking receiver and spectrum analyzer functions
- Common user interface across all Warrior products
- IESS, XTAR, WGS and DSCS compliant
- Airlift without use of spreader bars
- High quality UPS with shore power surge protection
- Shore power or generator (25 hours continuous operation without refueling), meets MIL-STD 810F roadability requirement

Applications

- Command Control, Reachback and Range Extension
- Voice, data and video
- EoIP, VoIP

Programs

- JNN
- WWSS
- WIN-T
- SPAWAR
- Trojan Spirit
- SWAN

Description

General Dynamics' Model 240 *Warrior Trailer Mounted SATCOM Terminal* (TMST), 2.4M, is an optimized, over-the-horizon communications vehicle ideally suited for tactical communications missions On-the-Quick-Halt. This terminal represents the second generation TMST design and is fully compatible and interoperable with the U.S. Army's Joint Network Node (JNN) and meets or exceeds the most recent JNN specifications for the Satellite Transportable Terminal (STT).

Improving on previous designs, the Warrior Model 240 TMST incorporates proprietary *active compensation tracking* techniques that positively track out the effects of wind while permitting significant platform weight reduction. The resulting trailer frame absorbs more of the off-road shock and vibration while also providing increased rack and storage space capacity for additional equipment, systems or fuel. *Active compensation tracking* also eliminates the necessity for outriggers permitting simple jackstands to provide stabilization as needed and facilitates quicker setup and teardown while further reducing structural weight. The TMST is designed to carry all equipment necessary to support SATCOM bands plus Troposcatter.

Warrior™ Model 240 Trailer Mounted SATCOM Terminal (TMST)

General Specifications

System Performance	Receive	Transmit
Frequency Bands (GHz)		
C, 2-port LP	3.625-4.200	5.850-6.425
C, 2-port CP	3.625-4.200	5.850-6.425
X, 2-port, CP (rev pol)	7.25-7.75	7.9-8.4
Ku, 4-port, LP	10.95-12.75	13.75-14.5
Ka, 2-port, CP	20.2-21.2	30.0-31.0
G/T (@ 20° elevation)		
C	18.0 dB/° K	
X	23.1 dB/°K	
Ku	25.5 dB/°K	
Ka	28.7 dB/°K	
EIRP (max)		
C (with 400W TWTA)	63.0 dBW	
X (with 600W Tri-band TWTA)	70.6 dBW	
Ku (with 750W TWTA)	76.7 dBW	
Ka (with 250W TWTA)	77.6 dBW	

RF Terminal	
Antenna	2.4 meter (94.5 in.) carbon fiber (3-piece configuration) with 3-axis motorized positioner
Travel: Azimuth Elevation Polarization	 ±150° continuous 0° to 90° of reflector boresight ±90°
Wind: Operational Survival, stowed (with tie downs)	 45 mph (72 kph) gusting to 60 mph (96 kph) >90 mph (145 kph)
Temperature Range	Operational -30° C to +55° C MIL-STD ECU (R407C)
Installation Time	<20 minutes
Transport	HMMWV or other wheeled vehicle, CH-47 or C-130 aircraft, rail rated (MIL-STD 209K & 810F compliant)
System Weight	<3900 lbs. (wet)
Vehicle Size (inches)	87 W x 97 H x 190 L
Onboard Storage	27 cubic feet provides enough space to store multiple amplifiers and feeds (for multi-band operation) or other equipment
Power Consumption	<2900 KVA + ECU (1.9 kw)
Generator Run Time	25 hours
Modems (compatible with FDMA, TDMA, CDMA systems)	Multiple modems supported simultaneously (Radyne, ViaSat Linkway, iDirect, Advantech, ComTech, Hughes, others)
High Power Amplifiers (HPAs)	Multiple configurations available using CPI, MCL, Xicom and VertexRSI SSPAs

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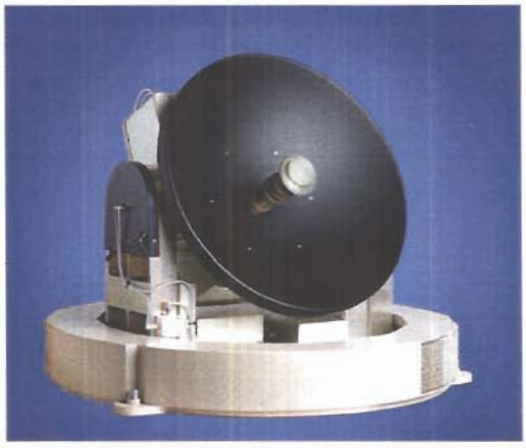
Vertex RSI

Satcom-on-the-Move™ Model 20 Terminals

Products • Service • Solutions



Model M20-18 (radome not shown)

Key Features

- Reliable high data rate satellite communications while On-the-Move in rugged off-road conditions
- World class 'on-satellite' tracking accuracy achieved via a combination of integral satellite beacon receiver, gyro stabilization, and inertial measurement unit[2]
- Ku Tx/Rx data rates : up to 1.54 Mbps or more, clear sky[3]
- 18, 20, 24, and 30 inch (45, 50, 60, and 75cm) antenna diameters available
- Select from a variety of Ku and Ka quick-change payloads to meet specific requirements: Ku Tx/Rx, Mil Ka Rx or Tx/Rx (commercial Ka band optional)
- 100% low risk and military proven technology
- Terminal includes the antenna, positioner, servo controller, beacon receiver, low noise amplifier, block up and down converters and high efficiency solid state power amplifier, all under radome and above the deck
- Simple L-band I/O provides direct interface with standard modem systems. RS232 interface for control/monitor with standard PC[1]
- Designed for use on a variety of military wheeled and tracked vehicles and heavy duty commercial vehicles in a wide range of operational conditions
- Flush Mount Above-the-Deck™ modular design for ease of installation and maintenance. Modular design allows custom configuration to meet customer unique mounting constraints.
- Integral air-to-air heat exchanger for high temperature environments
- Supports vehicle NBC Compliance

Model M20-30

[1]PC can be provided by customer or quoted as an option.
[2]The required inertial measurement unit (IMU) is external to the SOTM terminal and can be either provided by the customer or quoted as an option.
[3]Exact performance tied to specific requirements.

GENERAL DYNAMICS
C4 Systems

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Satcom-on-the-Move™ Model 20 Terminals

Specifications	18" Aperture	20" Aperture	24" Aperture	30" Aperture
Frequency – Receive	10.95 - 12.75 GHz			
Frequency – Transmit	13.75 - 14.50 GHz			
G/T (30° El, midband)	12.2 dBi/°K	13.1 dBi/°K	14.7 dBi/°K	16.6 dBi/°K
EIRP (midband)	46.0 dBiW	46.9 dBiW	48.5 dBiW	50.4 dBiW
Beamwidth, 3dB, (Rx/Tx, midband)	3.7° / 3.1°	3.4° / 2.8°	2.8° / 2.4°	2.2° / 1.9°
Gain (Rx/Tx, midband)	32.7 / 34.4 dBi	33.6 / 35.3 dBi	35.2 / 36.9 dBi	37.1 / 38.8 dBi
Sidelobes, Tx	Meets FCC Part 25.222			
Polarization	H/V or V/H actively selectable			
Tx Cross Pol Isolation	>30 dB			
Azimuth Travel	360° Continuous			
Elevation Travel (Full performance)	0° (horizon) to + 80°			
Elevation Travel (total)	0° (horizon) to + 95°			
Polarization Travel	360° Continuous			
Tracking Performance	Meets FCC Part 25.222 in Churchville B and Perryman 3 conditions			
Satellite Acquisition Time	<5 sec			
Height	22.0"	23.7"	31.1"	34.0"
Diameter (Radome)	22.2"	23.7"	28.4"	34.9"
Diameter (footprint at base)	27.5"	27.5"	27.5"	27.5"
Weight	170 lbs	172 lbs	175 lbs	192lbs
Maximum Vehicle Speed	>60 mph (100 km/hr)			
Operating Temperature	-40° to +55° C			
Storage Temperature	-51° to +71° C			
Supply Voltage	28 VDC per MIL-STD-1275B			
Power	336W cont 1260W peak			

Data is subject to change without notice. Contact General Dynamics for specific application recommendations.

GENERAL DYNAMICS
C4 Systems

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Satcom-on-the-Move™ Terminal Model 20 X-Band

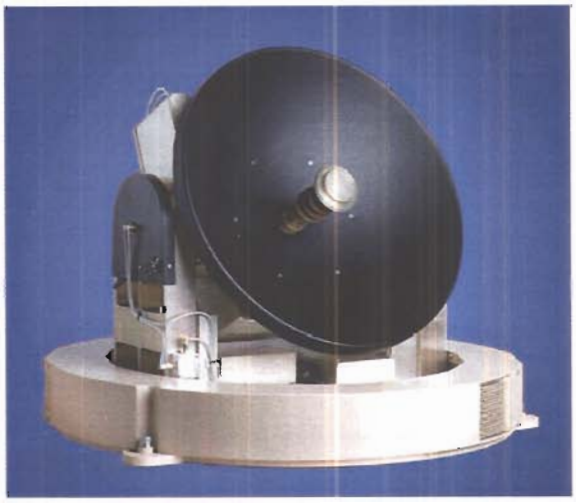
Products • Service • Solutions

Model M20-30 (without radome)

- Terminal includes the antenna, positioner, servo controller, beacon receiver, low noise amplifier, block up and down converters and high efficiency solid state power amplifier, all under radome and above the deck.
- Simple L-band I/O provides direct interface with standard modem systems. RS232 interface for control/monitor with standard PC[1]
- Designed for use on a variety of military wheeled and tracked vehicles and heavy duty commercial vehicles in a wide range of operational conditions
- Flush Mount Above-the-Deck™ modular design for ease of installation and maintenance. Modular design allows custom configuration to meet customer unique mounting constraints.
- Integral air-to-air heat exchanger for high temperature environments
- Supports vehicle NBC Compliance

Key Features

- Reliable high data rate satellite communications while On-the-Move in rugged off-road conditions
- World class 'on-satellite' tracking accuracy achieved via a combination of integral satellite beacon receiver, gyro stabilization, and inertial measurement unit[2]
- 18, 20, 24, and 30 inch (45, 50, 60 and 75 cm) antenna diameters available[3]
- Select from a variety of optional X, Ku and Ka interchangeable payloads to meet specific requirements
- 100% low risk military-proven technology



Model M20-18 (without radome)

[1] PC can be provided by customer or quoted as an option.
[2] The required inertial measurement unit (IMU) is external to the SOTM terminal and can be either provided by the customer or quotec as an option.
[3] 40 in (100 cm) apertures available with larger Model 24 series pedestal.

GENERAL DYNAMICS
SATCOM Technologies

Vertex RSI

Satcom-on-the-Move™ Terminal Model 20 X-Band

Specifications	MODEL 20-18	MODEL 20-20	MODEL 20-24	MODEL 20-30
Aperture Size	18 in (45 cm)	20 in (50 cm)	24 in (60 cm)	30 in (75 cm)
Frequency – Receive	7.25 – 7.75 GHz			
Frequency – Transmit	7.90 – 8.40 GHz			
G/T (30° El, midband)	8.3 dBi/°K	9.3 dBi/°K	10.8 dBi/°K	12.8 dBi/°K
EIRP (midband)	41.8 dBiW	42.7 dBiW	44.3 dBiW	46.3 dBiW
Beamwidth, 3dB, (Rx/Tx, midband)	5.9° / 5.4°	5.3° / 4.9°	4.4° / 4.1°	3.5° / 3.3°
Sidelobes, Tx	MIL-STD 188-164A			
Polarization	Circular, RH/LH or LH/RH, Remotely Selectable			
Azimuth Travel	360° Continuous			
Elevation Travel (Full performance)	0° (horizon) to + 80°			
Elevation Travel (total)	0° (horizon) to + 90°			
Tracking Performance	Churchville B and Perryman 3 conditions			
Axial Ratio	<1.2 dB			
Height	22.2" (55.9 cm)	23.9" (60.2 cm)	31.3" (78.9 cm)	34.2" (86.4 cm)
Diameter (Radome)	22.6" (56.4 cm)	24.1" (60.2 cm)	28.8" (72.1 cm)	33.3" (88.6 cm)
Diameter (footprint at base)	27.5" (69.8 cm)	27.5" (69.8 cm)	27.5" (69.8 cm)	27.5" (69.8 cm)
Weight	160 lbs (72.7 kg)	162 lbs (73.6 kg)	165 lbs (75 kg)	182 lbs (82.7 kg)
Maximum Vehicle Speed	>60 mph (100 km/hr)			
Operating Temperature	-20° to +55° C			
Storage Temperature	-51° to +71° C			
Supply Voltage	28 VDC per MIL-STD-1275B			
Power	336W cont, 1260W peak			

GENERAL DYNAMICS
SATCOM Technologies

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Data is preliminary and subject to change without notice. Contact General Dynamics for specific application recommendations.

Homeland Warrior Terminal

First Responder

Feature Set:

- Reliable wireless communications system developed specifically for rapid deployment
- Mini-GSM or –CDMA base station
- Easily connects to existing GSM/CDMA, PSTN, using satellite/ VSAT infrastructure
- All-IP network operation
- Scalable from 1 to 3000 subscribers
- Wireless service in minutes using personal or commercial cell phones
- Vehicle mount and tactical transport options available
- Easily integrates into existing command and control or tactical vehicles
- Basic Integrated terminal Includes:
  - Antenna (TX/RX) with controller
  - Satellite Modem for HNS service
  - Analog to IP converter
  - Two mobile basestations
  - Transit cases
- Price range $75K to $100K depending on options

Model HLW200
CELL/SATCOM Unit

Homeland Warrior Terminal

First Responder

Product Concept: *Cellular/SATCOM*

Rapid Response – the reliable wireless communications system for immediate deployment applications – is ideal for emergency response, disaster recovery, or tactical communications situations. Available in GSM, CDMA or a combination of technologies, the Rapid Response solution provides immediate service, fast capacity build-out and extends coverage to surrounding areas. Supporting both localized voice and data services allows for immediate coverage in emergency situations between critical personnel within the targeted coverage area.

Scalable from 1 to 3000 subscribers, Rapid Response incorporates the AirCore® RapidMSC, which can be deployed in minutes as a single site network, or provide full GSM/CDMA NSS functionality as an extension to existing network infrastructure. Coupled with a mini-GSM or – CDMA base station, Rapid Response lowers operational and start-up costs, reduces power and space requirements, and has little or no maintenance. In addition, it can be equipped with TECORE's IntelliJAM to provide complete user control of a defined wireless coverage area.

Rapid Response Command Center

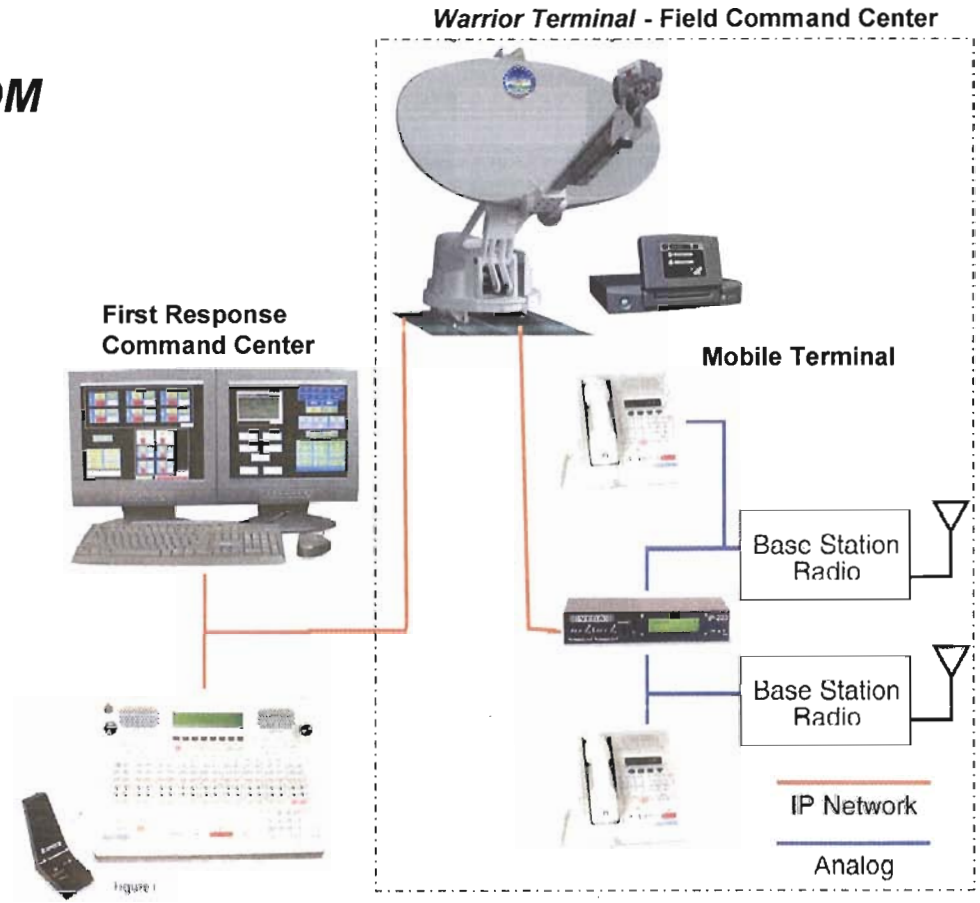
Block Diagram

Homeland Warrior Terminal

First Responder

Product Concept: *LMR/SATCOM*

This product gives Firefighters, Police and EMTs the ability to communicate to both Local and Federal Command Centers. It allows the use of already existing Land Mobile Radio (LMR) technologies which is converted to IP and connected to any Command Center for two-way communications using HNS service. This allows communications from anyone to anyone.



Block Diagram

Homeland Warrior Terminal

First Responder

Feature Set:

- Terminal can be "trailerized" or bolted/clamped to vehicle rooftop.
- Rapid setup (less than 5 minutes)
- Uses already in place handheld LMR radios
- Converts analog LMR radios into IP
- Satcom connection to any city and/or Command Center
- Communications from anyone to anyone
- Basic Integrated terminal Includes:
  - Antenna (TX/RX) with controller
  - Satellite Modem for HNS service
  - Analog to IP converter
  - Two mobile basestations
  - Transit cases
- Price range $30 to $50K depending on options

Model HLW100
LMR/SATCOM Unit

GENERAL DYNAMICS
C4 Systems

Warrior™ Terminals

Ku-Band Satellite

Warrior™ 240 Hub

2.4-Meter Manual Ku-band Flyaway with 40W SSPA/BUC and LNB

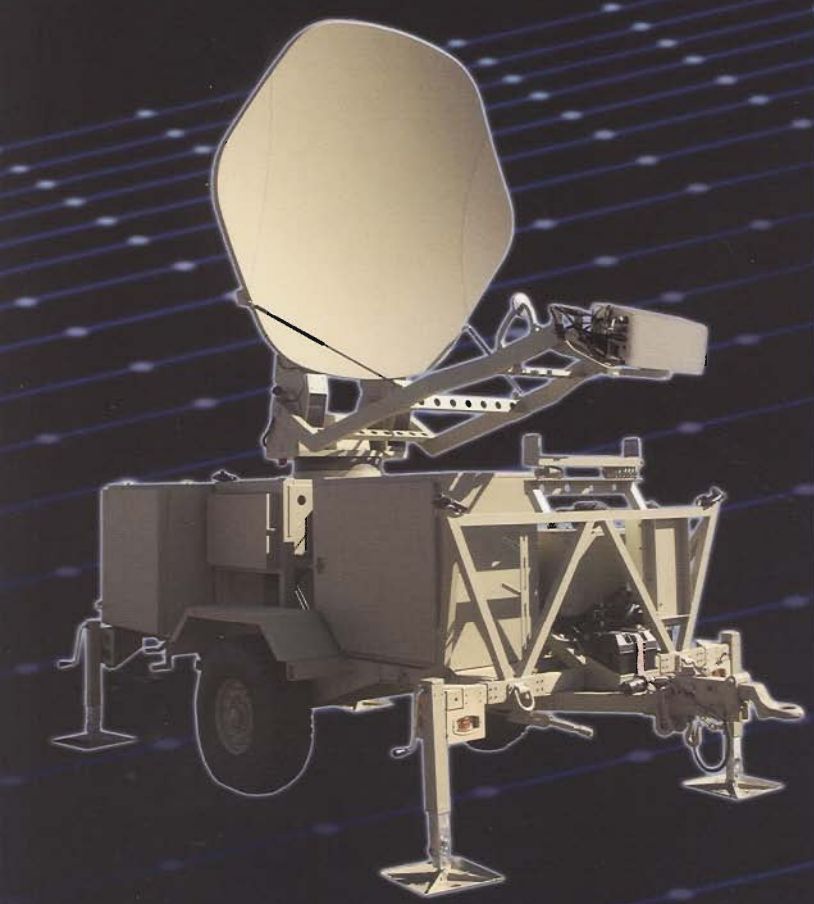
Warrior™ 100 WIP-T

1-Meter Ku-band Back-Pack Terminal with 15W SSPA/BUC, LNB and Controller

Warrior™ Satcom-on-the-Move™

24-inch Ku-band SOTM with 20W SSPA/BUC, LNB and Controller

Warrior™ Model 240 Trailer Mounted SATCOM Terminal (TMST)



Features:

- Next generation trailer offers X, Ku, Ka-band and Troposcatter operation on a single trailerized platform; C-band configurations also available
- Weighs less than 3900 lbs. (1755 kg) fully loaded, including fuel
- Active compensation tracking eliminates outriggers - faster setup, smaller footprint and reduced structural weight
- Environmentally controlled equipment enclosure, 2-bay with 38 RUs of installed rack space plus central bay with space for up to 15 RUs
- Supports a wide variety of modems, multiple carriers and data rates
- Terminal controller combines antenna control, M&C, tracking receiver and spectrum analyzer functions
- Common user interface across all Warrior products
- IESS, XTAR, WGS and DSCS compliant
- Helicopter lift without use of spreader bars
- Shore power (110/240, 1 phase Vac) or generator (36 hours continuous operation without refueling), meets MIL-STD 810F roadability requirement
- Full online, dual isolation UPS
- Environmental control unit (ECU) allows for operation in extreme climates (both hot and cold)
- I/O panels allow for easy access to all interconnect cables
- Some modular RF payload configurations incorporate integrated BUC on HPAs to allow for transfer of both transmit and receive signals at L-band
- Tracking accuracy meets MIL-STD-188-164A in winds of 45 mph (72 kph) gusting to 60 mph (96 kph) at Ka-band
- EMC certifiable
- Communications equipment CE configurable
- Rail rated and Munson Road qualified
- European road homologation in review

Description:

General Dynamics' Model 240 *Warrior™ Trailer Mounted SATCOM Terminal* (TMST), 2.4M, is an optimized, over-the-horizon communications vehicle ideally suited for tactical communications missions On-the-Quick-Halt. This terminal represents the second generation TMST design and is fully compatible and interoperable with the U.S. Army's Joint Network Node (JNN). The terminal meets or exceeds the most recent JNN specifications for the Satellite Transportable Terminal (STT), and in August 2007 was selected for WIN-T Increment 1 / JNN. The TMST is fully interoperable, making it an excellent choice for NATO and international MOD requirements.

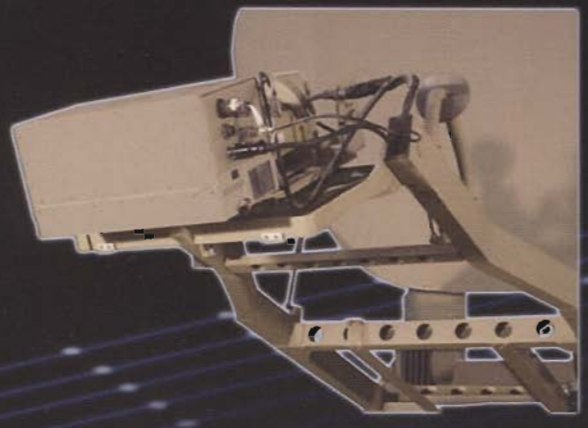
Improving on previous designs, the Warrior™ Model 240 TMST incorporates proprietary *active compensation tracking* techniques that positively track out the effects of wind while permitting significant platform weight reduction. The resulting trailer frame absorbs more of the off-road shock and vibration while also providing increased rack and storage space capacity for additional equipment, systems or fuel. *Active compensation tracking* eliminates the necessity for outriggers, permitting simple jackstands to provide stabilization as needed and facilitates quicker setup and teardown while further reducing structural weight. The TMST is designed to carry all equipment necessary to support multiple SATCOM bands plus Troposcatter.

Vertex RSI

GENERAL DYNAMICS
SATCOM Technologies

Warrior™ Model 240 Trailer Mo

- C, X, Ku, Ka-band and Troposcatter (up to 3 modular RF payloads stowable on board and swappable in 5 minutes)
  (shown here configured as Ku-band with 250 watt power amplifier and integrated BUC to allow for transfer of both transmit and receive signals at L-band)



- Helicopter lift without use of spreader bars
- Towable by up-armored vehicles

- Shore power (110/240, 1 phase Vac) or onboard 8KW generator with 36 hours continuous operation without refueling
- On board fuel pump for unmanned refueling or continuous operation via external fuel source
- Oil mate system extends service period to beyond 1,000 hours
- Oil filter can be changed while system is operating, limiting downtime

unted SATCOM Terminal (TMST)

- Environmentally controlled equipment enclosure, 2-bay with 38 RUs of installed rack space plus central bay with space for up to 15 RUs

- Active compensation tracking eliminates outriggers (faster setup and smaller footprint)

- 27 cubic feet (0.81 cubic meters) onboard storage (includes space for spares and multiple modular RF payloads)

General Specifications

System Performance	Receive	Transmit
Frequency Bands (GHz)		
C, 2-port LP	3.625-4.200	5.850-6.425
C, 2-port CP	3.625-4.200	5.850-6.425
X, 2-port, CP (rev pol)	7.25-7.75	7.9-8.4
Ku, 4-port, LP	10.95-12.75	13.75-14.5
Ka, 2-port, CP	20.2-21.2	30.0-31.0
G/T (@20° elevation)		
C	18.0 dB/° K	
X	23.1 dB/° K	
Ku	25.5 dB/° K	
Ka	28.7 dB/° K	
EIRP (saturated)		
C (with 400W TWTA)	63.0 dBW	
X (with 600W Tri-band TWTA)	70.6 dBW	
Ku (with 750W TWTA)	76.7 dBW	
Ka (with 250W TWTA)	77.6 dBW	

RF Terminal	
Antenna*	2.4 meter (94.5 in.) carbon fiber with 3-axis motorized positioner
Travel:	
Azimuth	± 150° continuous
Elevation	0° to 90° of reflector boresight
Polarization	± 90°
Wind:	
Operational	45 mph (72 kph) gusting to 60 mph (96 kph)
Survival, stowed (with tie-downs)	>90 mph (145 kph)
Temperature Range	Operational -30° C to +55° C MIL-STD ECU (R407C)
Installation Time	<20 minutes
Transport	HMMWV or other wheeled vehicle, CH-47 or C-130 aircraft, rail rated (MIL-STD 209K & 810F compliant) and Munson Road qualified
System Weight (typical)*	<3900 lbs. (1755 kg), including fuel
Vehicle Size	87" W x 97" H x 190" L (221 cm W x 246 cm H x 482 cm L)
Onboard Storage	27 cubic feet with space for spares and multiple modular RF payloads
Power Consumption (typical)*	<2900 KVA + ECU (1.9 kw)
Generator Run Time	36 hours without refueling
Modems (compatible with FDMA, TDMA, CDMA systems)	Multiple modems supported simultaneously (Radyne, ViaSat Linkway, iDirect, Advantech, ComTech, Hughes, Paradise, others)
High Power Amplifiers (HPAs)	Multiple configurations available using CPI, MCL, Xicom, WaveStream and VertexRSI SSPAs

*Configuration dependent

GENERAL DYNAMICS
SATCOM Technologies

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Warrior™ SATCOM and Troposcatter Communications Terminals

Reliable Fixed and Mobile Communications Units for Current Force Requirements, Homeland Defense, Field Service and News and Weather Reporting

GENERAL DYNAMICS

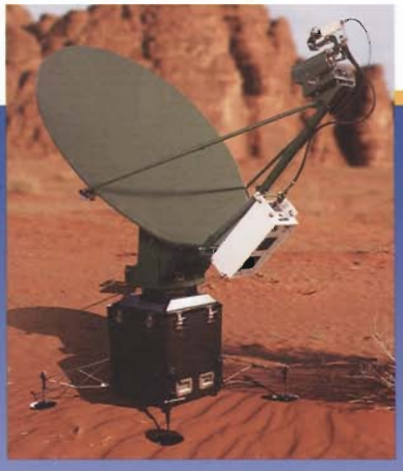
Warrior™ SATCOM and Troposcatter Communication Terminals

Warrior™ Tactical Terminals

Quick to deploy and easy to use, the Warrior™ tactical SATCOM and Troposcatter terminals are ideal for tactical reachback and range extension applications. The rugged Warrior™ family of terminals operates in C, X, Ku and Ka bands and is designed to support a wide range of applications to meet current and future force transformation requirements. From Troposcatter to SATCOM, Warrior's fixed, mobile, man-portable and transportable terminals deliver secure, reliable high-data rate communications in the harshest conditions.

Terminal Antenna Size:

- 1.0, 1.2, 1.5, 1.8M
- 2.4, 3.6, 4.6, 6.3M
- Satcom-on-the-Move™
- Troposcatter Terminals
- High reliability SSPA with BUC
- Next generation terminal controller
- Ku tunable LNB
- Rugged, lightweight transport cases



Warrior™ Strategic Terminals

Secure and reliable communications for surveillance and intelligence gathering is an essential element of strategic communications. Warrior™ terminals offer the best alternative for secure (COMSEC Type 1, TRANSEC Type 2) reliable communications on a global scale.

Terminal Antenna Size

- 1.0, 1.2, 1.5, 1.8M
- 2.4, 3.6, 4.6, 6.3M
- 9.0 to 20M
- Satcom-on-the-Move™
- Fixed and Mobile
- High reliability SSPA with BUC
- Next generation terminal controller
- Ku tunable LNB
- Rugged, lightweight transport cases

High-Data Rate, Instant and Live Broadband Communications

Today's military and homeland defense operations require reliable, high-data rate communications to quickly deploy and control field units and advise action teams of changing situations. Disaster recovery, business continuity and news and weather reporting also demand flexible and instant transmission and reception of video, voice and data.

General Dynamics' Warrior™ family of tactical and strategic SATCOM and Troposcatter terminals is available now to provide unparalleled communications for military, homeland defense, disaster recovery, field service and commercial newsgathering applications.

General Dynamics' innovative, multi-band and multi-mode tactical terminals allow communication via satellite, troposcatter, diffraction or line-of-sight (using C, X, K, Ku or Ka-bands) in highly transportable self-contained, field configurable packages. The terminals incorporate modern, industry-leading carbon fiber, truck/trailer-mount or "fly-away" antenna systems to suit a variety of applications. The Warrior™ 2.4M trailer-mounted SATCOM terminal can be converted to operate as a Troposcatter terminal in a matter of minutes.

Ranging in antenna size from less than 1 Meter to 6.3-Meters, Warrior's fixed, mobile, man portable and transportable units deliver reliable and secure (COMSEC Type 1, TRANSEC Type 2) high-data rate communications in the harshest conditions.

Warrior™ terminals comprise all the elements required for complete communications interoperability and control including antennas, electronic components for transmission and reception, cabling, control systems, modems and integrated products to create a complete SATCOM or Troposcatter solution.

Global Reach, Fast Response

Fast and reliable communications require a resilient global satellite network. General Dynamics' Warrior™ terminals deliver the robust IP infrastructure demanded by military, government and field service agencies today. Whether it's for mission critical applications or to improve communications efficiency and effectiveness, Warrior™ terminals provide the right level of support including voice, data, virtual private networks, continuity of operations, mobile access, multicast delivery, video streaming and more.

Seamless, Secure, Alternative Communications for Disaster Recovery and Business Continuity

When responding to natural disasters, first responders have come to rely on satellite communications to keep local units in touch with remote command centers. Warrior™ SATCOM terminals offer the best alternative for secure, reliable communications on a global scale. Warrior™ terminals provide solutions to meet every application from quick deploy point-to-point tactical requirements, to worldwide strategic surveillance and intelligence gathering. Warrior™ terminals provide highly secure satellite communications – a true alternative communications infrastructure – that stays up and running at broadband speed even when terrestrial networks fail.

Network Centric Support

US military services are quickly moving toward Network Centric Warfare where close and constant communications between deployed units and command structures are required at all levels. Warrior™ SATCOM and Troposcatter terminals, operating across C and Ku bands and using different access techniques, meet the Network Centric challenge. In addition, next generation Warrior™ terminals meet the US Transformational Communications Architecture requirements to allow the US Joint Forces Command and international forces to communicate with compatible systems.

The Warrior 1-Meter man-portable satellite terminal is easily transported in two lightweight backpacks.

Ultra-Portable Warrior™ Manpack 1.0 Meter SATCOM System

The Warrior™ 1.0M 'backpackable' satellite system features built-in intelligence to enable an operator to quickly acquire a satellite and establish a reliable broadband link (up to 4 Mbps) in minutes anywhere in the world in the harshest conditions.

This next-generation portable satellite system is fully automated and easily transportable in helicopters, aircraft and even small vehicles. Fully self-contained in two light-weight, manportable backpacks, the 1.0M system is ideally suited for highly mobile users who need to initiate broadband communications on short notice or on a temporary basis.

- Ku-Band Standard (Ka and X Band optional)
- Weatherproofed connections
- Hermetically sealed RF electronics
- Simplified auto-acquire satellite process
- Remote Operations up to 160 ft (<50 Meters) via Ethernet
- Ergonomically designed backpacks for easy transport
- Lightweight carbon fiber antenna
- Manportable
- Airline checkable
- Fits in small vehicles

IP-on-the-Move™

Warrior's highly mobile On-the-Move™ terminals are ideally suited to provide reliable, and instant IP while on-the-move. Whether for commercial or civil defense applications, the terminals can be used to supplement or replace the terrestrial communications infrastructure to aid disaster recovery, speed business continuity or provide instant and live news and weather reporting from remote areas.

- Ku/Ka-band Operation
- Reliable "on-satellite" tracking accuracy
- "Point & Go" Operation
- Low profile

Combat Tough / Instant and Live News and Weather Reporting

Warrior's SATCOM terminal is leading the market by delivering true, On–the–Move™ satellite communications.

Available in 18, 20, 24 and 30-inch terminals, the Warrior™ Satcom-on-the-Move™ (SOTM) terminals are the first of their type to be licensed by the FCC for use in the United States.

Ruggedized for use by a wide variety of military and commercial vehicles, Warrior™ SOTM terminals have proven their ability to deliver reliable, high-data rate video, voice and data communications over satellite while on the move.

Reliable transmission and reception of high-data rate communications while on-the-move expands the global reach and ensures the effectiveness and efficiency of today's satellite news and weather reporting.

Satcom-on-the-Move™ for Current and Future Command and Control

Real-world military conditions require uninterrupted high speed, video, voice and data communications between units on the move, tactical network nodes and command centers.

Warrior™ Satcom-on-the-Move™ terminals have proven their ability to deliver true, broadband communications while on-the-move in the US Army's most stringent field tests using terrestrial, airborne relay and satellite communications.

In challenging tests conducted for the US Army on moving vehicles over difficult, Churchville B-type terrain, Warrior's On-the-Move™ terminals proved their ability to deliver full-duplex, high-data rate communications, including voice and full-motion video over Ku or Ka-bands.

Mounted on HMMWV, Stryker and Bradley fighting vehicles, the terminals consistently 'locked on' to the satellite with an amazing pointing accuracy of less than 0.2 degrees while delivering 2 megabits per second uninterrupted transmit and receive capability with no adjacent channel interference.

Ship-based voice, data and video communications are supported using General Dynamics' X, Ku, TDRSS or Ka-Band Warrior™ Satcom-on-the-Move™ terminals. The terminals are available in two or three-axes configurations. Similarly, Ku and Ka-Band versions of this terminal support sub-sonic light or heavy airborne applications.

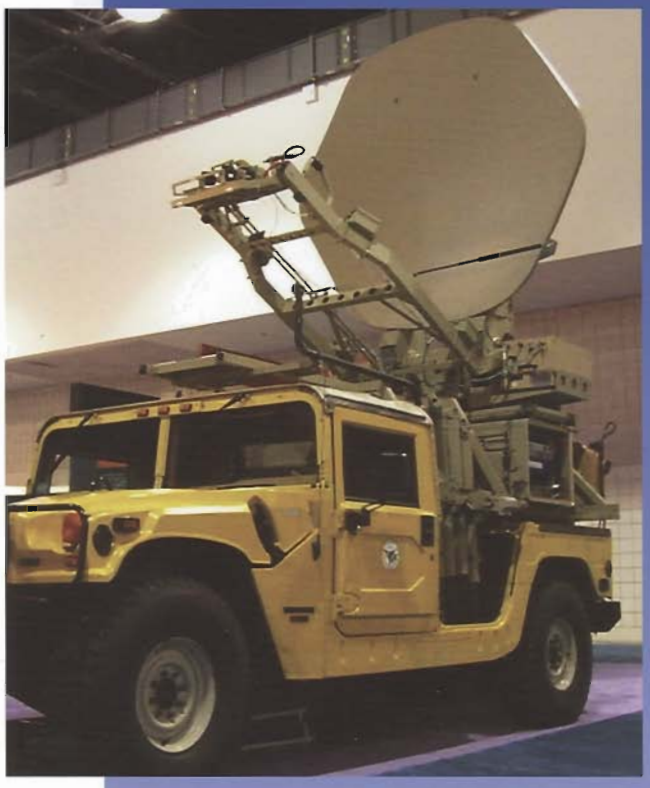
True, Satcom-on-the-Move™
General Dynamics' proven Warrior™ Satcom-on-the-Move™ terminals deliver high data rate communications including voice and full motion video while moving over obstacles and off-road terrain. The Warrior™ terminals are the first of their type to be licensed by the FCC for use in the United States.

- Ku/Ka-band Operation
- Reliable "on-satellite" tracking accuracy
- Tracking out dynamics of >2000°/sec²
- Low profile
- Ruggedized for use by HMMWV, Stryker and Bradley fighting vehicles

Warrior™ Product Application Chart

General Applications	Terminal Size											
	SOTM								TMST	Troposcatter		
	.5M	.6M	.75M	1.0M	1.2M	1.5M	1.8M	2.4M	2.4M	2.4M	4.6M	6.3M
16 Kbps Voice	•	•	•	•	•	•	•	•	•	•	•	•
64 Kbps ISDN	•	•	•	•	•	•	•	•	•	•	•	•
144 Kbps Videoconferencing	•	•	•	•	•	•	•	•	•	•	•	•
384 Kbps Internet Access	•	•	•	•	•	•	•	•	•	•	•	•
1544 Kbps Document Imaging	•	•	•	•	•	•	•	•	•	•	•	•
2 Mbps VCR-Quality Video	•	•	•	•	•	•	•	•	•	•	•	•
6 Mbps Broadcast-Quality Video				•	•	•	•	•	•	•	•	•
10 Mbps Ethernet					•	•	•	•	•	•	•	•
25 Mbps HDTV						•	•	•	•	•	•	•
50 Mbps Bulk Transport							•	•	•	•	•	•
100 Mbps PBX LAN								•	•	•	•	•

(Configuration Dependent)



Over-the-Horizon Communications
Warrior's new small aperture Troposcatter terminal offers the tactical commander the flexibility of using Troposcatter or SATCOM for fast, efficient over-the-horizon communications.

In the Troposcatter mode, the Warrior™ terminal provides efficient "in-theater" over-the-horizon communications at 15.0-15.5 GHz over a span of 150 miles.

The new, anti-jam terminals transmit and receive at speeds up to 40 Mbps - three times faster than legacy troposcatter systems.

- Ku, Ka, Troposcatter and X-Band operation
- Next generation terminal controller combines antenna control, M&C, and spectrum analyzer functions
- New, advanced tracking methodology
- Increased pointing accuracy
- Ku-Band tunable LNB
- High reliability SSPA's for linear power
- 50° C operation without Cooling, Up to 60° C operation with cooling
- Multiple ECU options (MIL-STD or lightweight)
- Flexible Power Sources

Low Signature – Peak SATCOM Performance

General Dynamics' Warrior™ Satcom-on-the-Move™ terminals are sized to provide optimal throughput and performance with the minimum visual signature necessary.

Proper modem selection, speed and modulation and the latest encoding technology support the terminal's ability to allow full and simultaneous transmission and reception of video, voice and data while negating any Doppler effect while using these low-profile terminals on the move.

Extensive field tests affirm that Warrior's Satcom-on-the-Move™ terminals, using antennas of 20-inches or larger in diameter, are compatible with virtually any TDMA or FDMA modem.

Over-the-Horizon Communications: Warrior's Troposcatter/SATCOM Solution

Warrior's revolutionary dual mode Troposcatter/SATCOM terminals greatly extend the versatility and tactical options for "in-theater" over-the-horizon communications by offering the user the option to establish either Troposcatter, SATCOM, diffraction or line-of-sight operation in C, X, Ku or Ka-band.

The new tactical Troposcatter terminals use industry-leading carbon fiber antennas configurable for mounting on trucks, trailers or fly-away applications.

A novel Ku-Band Troposcatter antenna feed system generates simultaneous dual beams in the elevation plane, facilitating "angle diversity" transmission and eliminating the need for a second antenna used in conventional Troposcatter terminals. The new multi-mode terminals build upon the Company's industry-standard line of highly transportable tactical SATCOM terminals, sharing a mature, field-proven platform.

Beyond bringing Troposcatter communication capability into a modern paradigm for tactical terminal transportability, General Dynamics has set a new standard for Troposcatter link performance with its TM-20 Troposcatter Modem. With quad-diversity data rates to 20 Mbps, dual-diversity data rates to 40 Mbps and unmatched Eb/No and delay spread performance, the TM-20 has literally redefined troposcatter link capability.

Today's Troposcatter systems are smaller, lighter, more economical, more portable and more reliable than legacy systems. They operate at higher rates and require much less power to close the link.

Warrior™ 'On the Quick Halt'

General Dynamics' next generation Trailer Mounted SATCOM Terminal (TMST) is an optimized over-the-horizon (OTH) communications terminal ideally suited for tactical, Quick Halt communications missions. The ultra light-weight TMST can be configured for either SATCOM or Troposcatter communication to meet changing tactical requirements.

General Dynamics' TMST design is fully compatible and interoperable with the US Army's Joint Network Node (JNN) program. The 2.4-Meter antenna and terminal is easily set up in less than 20-minutes, carries its own on-board power generator and provides transmit and receive data rates up to 4 Mbps. The ultra-lightweight TMST trailer allows more armament to be allocated to towing vehicles, and facilitates transportation via helicopter, ship, flatbed truck and rail. Advanced tracking methods are employed to improve pointing and eliminate the need for outriggers. This innovation decreases the terminal setup time while reducing weight and complexity.

Strategic or tactical, stationary or On-the-Move™ General Dynamics' Warrior™ family of SATCOM and Troposcatter terminals provide an effective broadband solution for homeland defense, disaster recovery, field service, news gathering and current and future force requirements.

On the Quick Halt
Easily transportable, fast to set up, and automatic satellite acquisition, makes Warrior's Quick Halt SATCOM and Troposcatter terminal the ideal solution for reliable communications on the Quick Halt.

- Light-weight design techniques incorporate Ku, Ka, Troposcatter and X-Band operation on a single trailer frame
- Next generation terminal controller combines antenna control, M&C, and spectrum analyzer functions
- New, advanced tracking methodology
  - Increased pointing accuracy
  - Weight reduction
  - No outriggers - faster setup and smaller footprint
- Greatly increased electronics rack mount space (48-Rack Units)
- 3-bay environmentally controlled equipment enclosure
- Equipment storage space
- C-130 transportable
- Ku-Band Tunable LNB
- High reliability SSPA's for linear power
- 50°C operation without cooling; up to 60°C operation with cooling
- Mulitiple ECU options (MIL-STD or lightweight)
- Complete M&C for entire terminal permits both local and remote control
  - Built-in control and configuration computer
  - Remotely viewable spectrum analyzer features
- Supports wide variety of modems and multiple carriers
- Flexible power source

Trusted People, Trusted Performance

GENERAL DYNAMICS

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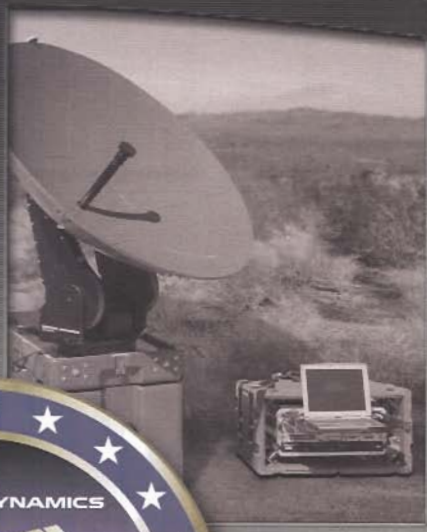
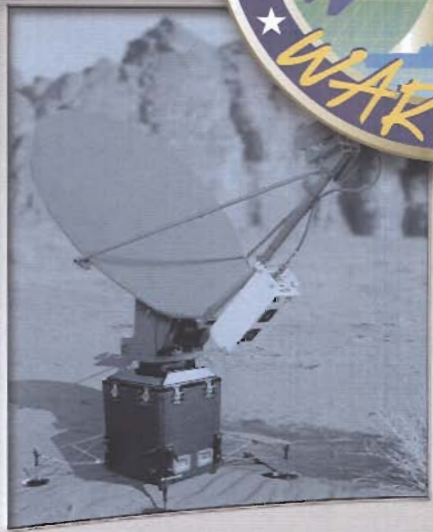
Warrior-DP-02/07

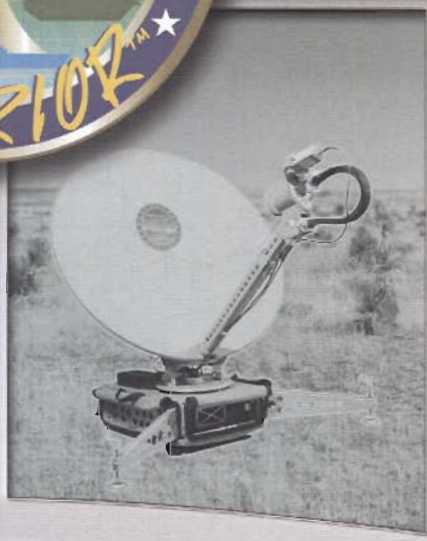
Strength of Performance



GENERAL DYNAMICS

WARRIOR™





GENERAL DYNAMICS

General Dynamics SATCOM Technologies is a world leader in the control and pointing of devices. Whether it's a large radio or optical telescope or a sub meter vehicle mounted terminal, SATCOM Technologies has the capability to provide the expertise required.

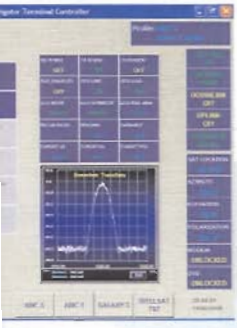
The company's controlling and pointing expertise has developed through our years of experience at controlling large structures with high precision. Systems have been engineered and manufactured to control large structures weighing in excess of 300 tons with azimuth and elevation velocities of 0.5°/second and position resolution of 0.6 arc seconds (0.00017°).

Our experience in working with these large structure has been combined with our extensive experience as a designer and manufacturer of earth stations. The ability to precisely point and control systems, coupled with advanced manufacturing capabilities in carbon fiber, allows our design engineers to create some of the lightest weight, precision terminals available in the marketplace. The result is our Warrior line of integrated terminals.

The Satcom-on-the-Move ™ terminals, part of the Warrior ™ line, utilize the same large structure control and pointing technology to achieve true on-the-move transmit and receive communications even under off-road Churchville B type conditions.

The transportable Warrior ™ Model 100, 120, 180 and 240 terminals draw uponthis same design and manufacturing expertise, resulting in products that are compact and lightweight, yet rugged, powerful and reliable .

Another area of expertise that has been brought to bear in the Warrior™ line is the pairing of our state-of-the-art Model 303 and 323 control systems with our network monitor and control solution. The system is further enhanced by the integration of full-function spectrum analyzer capabilities. Additionally, the Model 303 and 323 controllers have been designed to operate with the entire Warrior™ product line to provide the benefit of a common user interface.



General Dynamics SATCOM Technologies has merged our extensive design and manufacturing experience in the areas of antennas, control systems, precision pointing and M&C to create our Warrior ™ line of low cost, lightweight, high performance terminals. Whether your needs are disaster recovery, business continuity, news and weather reporting or military operations, the Warrior ™ line of terminals has a solution to work for you.

Trusted People, Trusted Performance.

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Satcom-On-The-Move™ Life Cycle Cost Comparison

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April 3, 2007

Satcom-On-The-Move™– Unique Factors

Uses more satellite downlink power than larger terminals

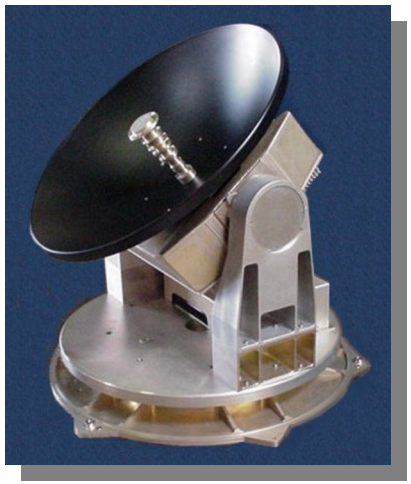
- Now possible on many satellites
- Cost per bit transmitted is higher than with larger terminals

Careful Uplink Power Control is required

- Some energy is radiated towards adjacent satellites
- Regulatory requirements exist for adjacent satellite protection
- Systems must simultaneously “close the link” and minimize interference

High antenna pointing accuracy is required

- Maximize on-satellite performance
- Reduced tracking accuracy drives higher satellite costs
- Minimize adjacent satellite interference
- Sometimes required by regulations



Mounting space is critical

- Small size desired by all users
- Smaller size requires more satellite power
- Smallest sizes cannot support real communications

Satcom-On-The-Move™– Unique Factors

Satellite resource "opportunity cost" should be considered

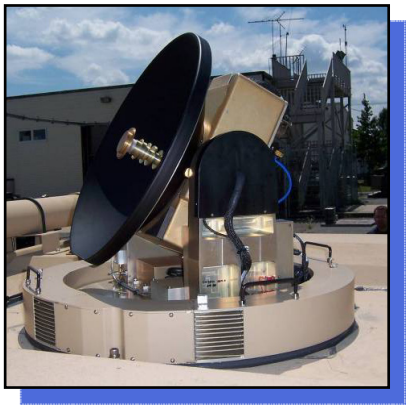
- Higher power than larger terminals could be used elsewhere
- Use justified for many mobile and portable applications
- Some satellites are already too full to support SOTM™

Terminals can be designed to optimize life cycle costs

- Larger antennas always reduce system operating cost
- Small antenna size for vehicle mounting conflicts with cost reductions
- Interoperability with legacy systems can make operation impractical

Regulatory environment must be considered

- As of start of 2007, just firming up in the United States
- Still no ITU standards or Recommendations
- Operation currently by exception rather than standard
- Regulations WILL be promulgated soon
  - Will require technical compliance for routine licensing



FSS Ku-Band Satcom-On-The-Move™ Operation

SOTM™ operation must be engineered like all links

- Smaller antennas have unique requirements, but can be supported
- Standard satellite system engineering tools can be used

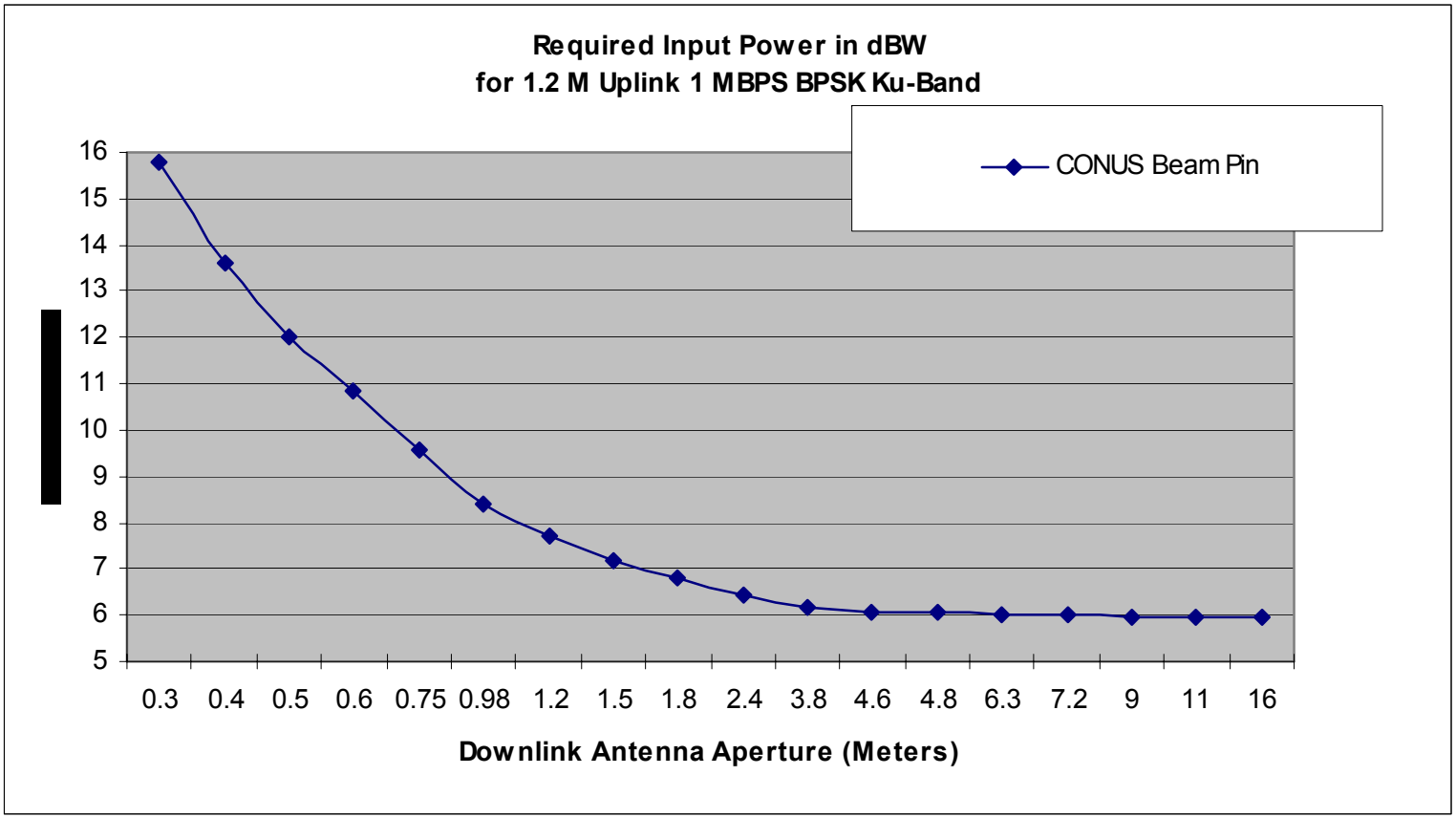
Power and bandwidth can be traded

- Larger antennas take less power and can run higher modulation orders
- Smaller antennas must be carefully controlled to prevent interference

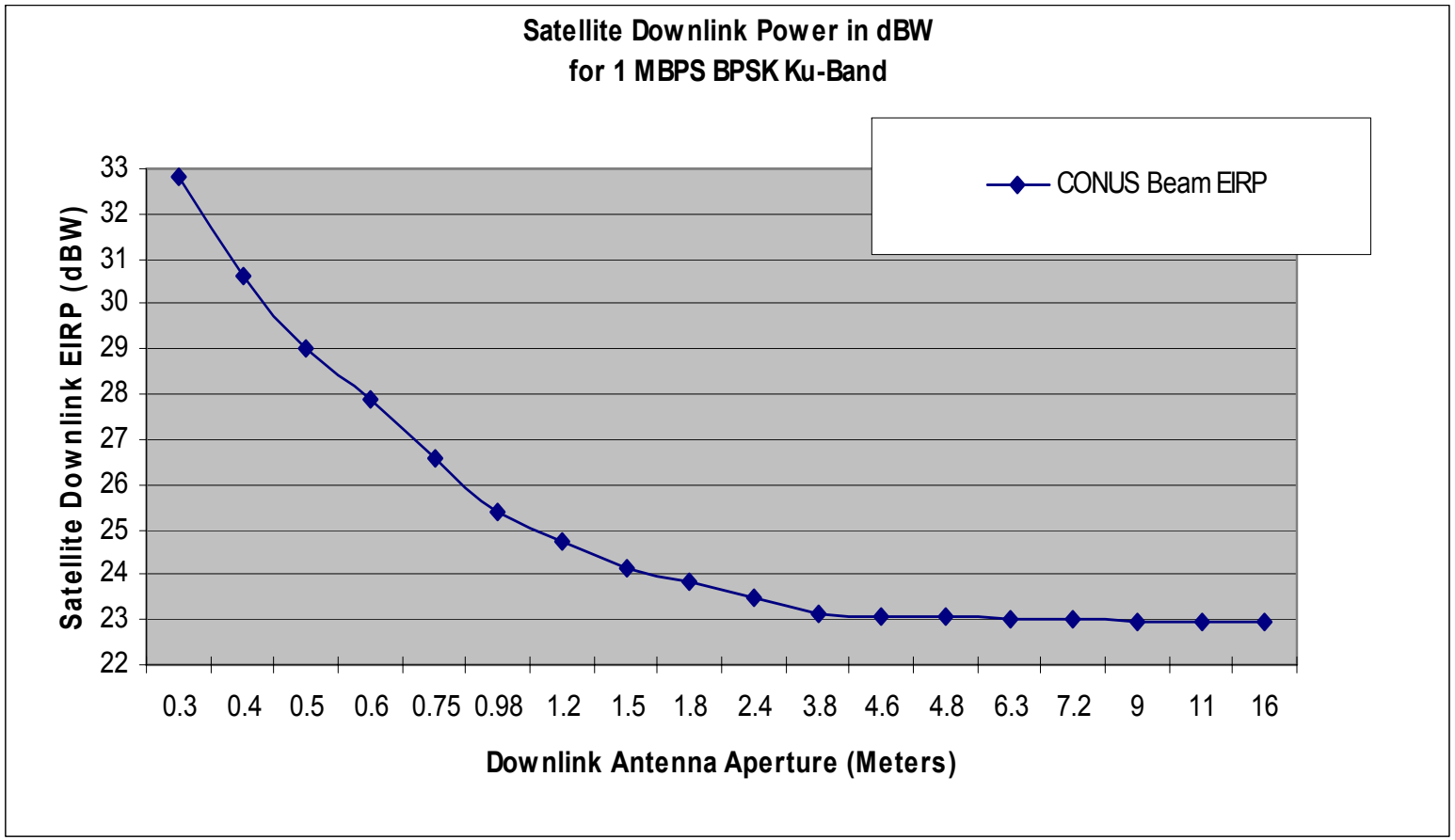
Power requirements can be graphically displayed

- The following graphs show uplink and downlink power
- These charts are “normalized” for 1 MBPS operation

Example FSS Ku-Band Uplink Input Power



Example FSS Ku-Band Downlink EIRP



FSS Ku-Band Example Link Analyses

SOTM™ link analyses permit us to calculate requirements

- Different size terminals take different satellite power for same data rate
- Smaller terminals have advantages and disadvantages

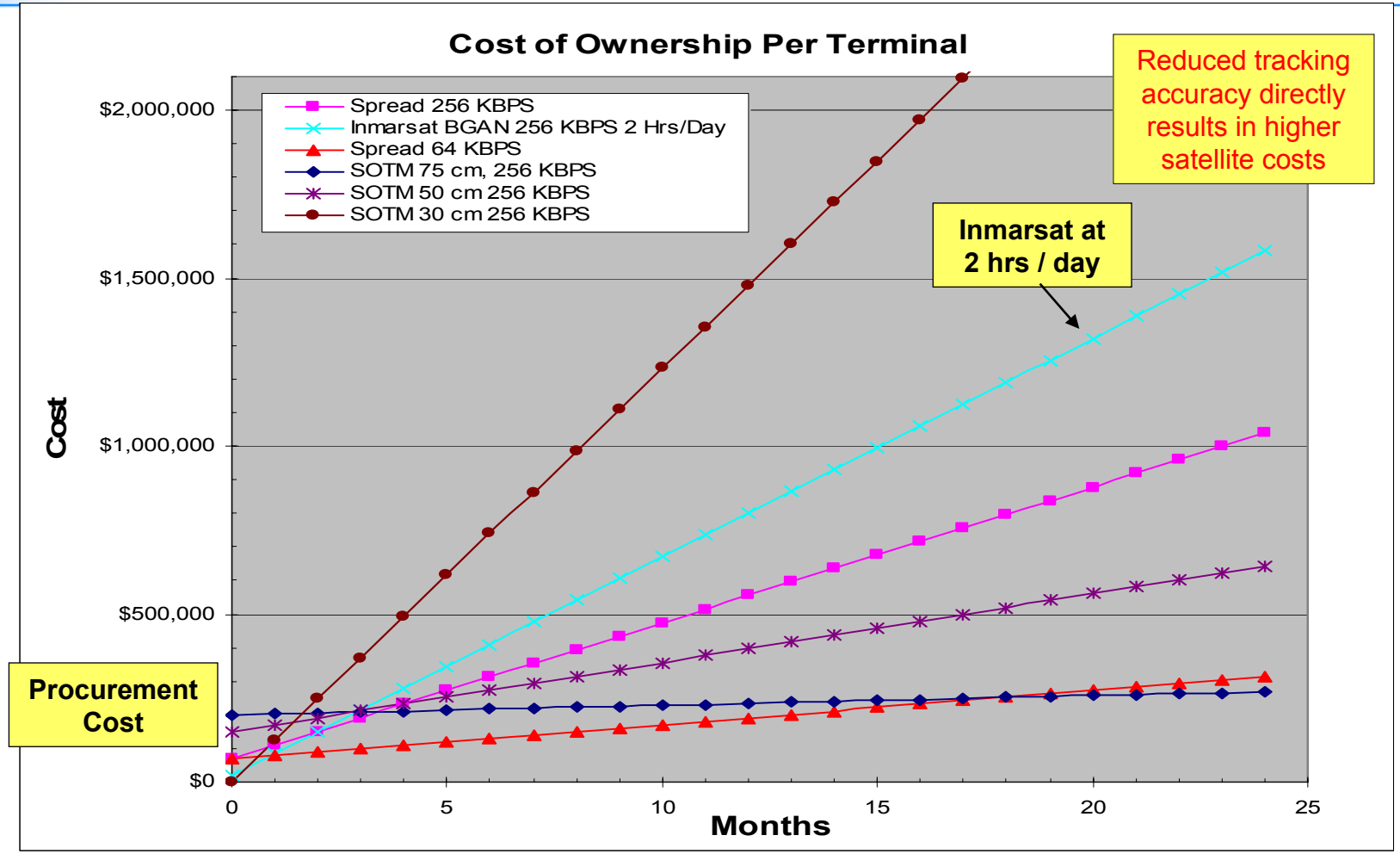
Transponder costs are dominant

- Even expensive $SOTM_{TM}$ procurement costs are not too significant
- Transponder costs drive system viability

Life Cycle Costs must be considered for network operation

- This is true for all of satcom, but may be more significant here
- Some operational requirements can be met no other way
- SOTM™ can provide cost-effective service from anywhere!
  - If properly designed and engineered

Example FSS Ku-Band Cost Of Ownership



Example Ku-Band Cost Of Ownership Parameters

Inmarsat 256 KBPS shown for comparison

- Only 2 hours / day for this example -- $18.07 / Minute

Ku-Band transponder costs included

- Typical cost of $4,000 / MHz / month
- All Ku-Band examples are full period – continuous 24 hrs / day

All cases except “Spread 64 KBPS” are 256 KBPS

- “Spread 64 KBPS” example is 64 KBPS using specific spread spectrum modem

ROM procurement costs included except “Spread 64 KBPS”

- “Spread 64 KBPS” curve has terminal procurement cost = $0
- All other cases show nominal ROM estimates – not a major factor in cost
  - It is easy to see that transponder costs are dominant

Alternative Use of Space Segment

Alternate uses of transponder should be considered

- Factors in to opportunity cost of SOTM™ operation
- SOTM™ cost stands on its own, but satellite capacity is not unlimited
- Obviously, most critical in situations with limited satellite capacity

For the cases shown in figure, alternative use could support:

SOTM Operation	Alternative Operation using 4.8 Meter Antenna
75 cm 256 KBPS	452 KBPS
50 cm 256 KBPS	4050 KBPS
30 cm 256 KBPS	24470 KBPS

X-Band Satcom-On-The-Move™ Operation

Multiple generations of X-Band satellites are on orbit

- Older generation has performance more like C-Band
  - Lower EIRP and G/T Capabilities
  - Most efficient with larger earth terminal antennas
- Newer generation have higher performance – more like FSS Ku-Band
  - These can support SOTM™ operation

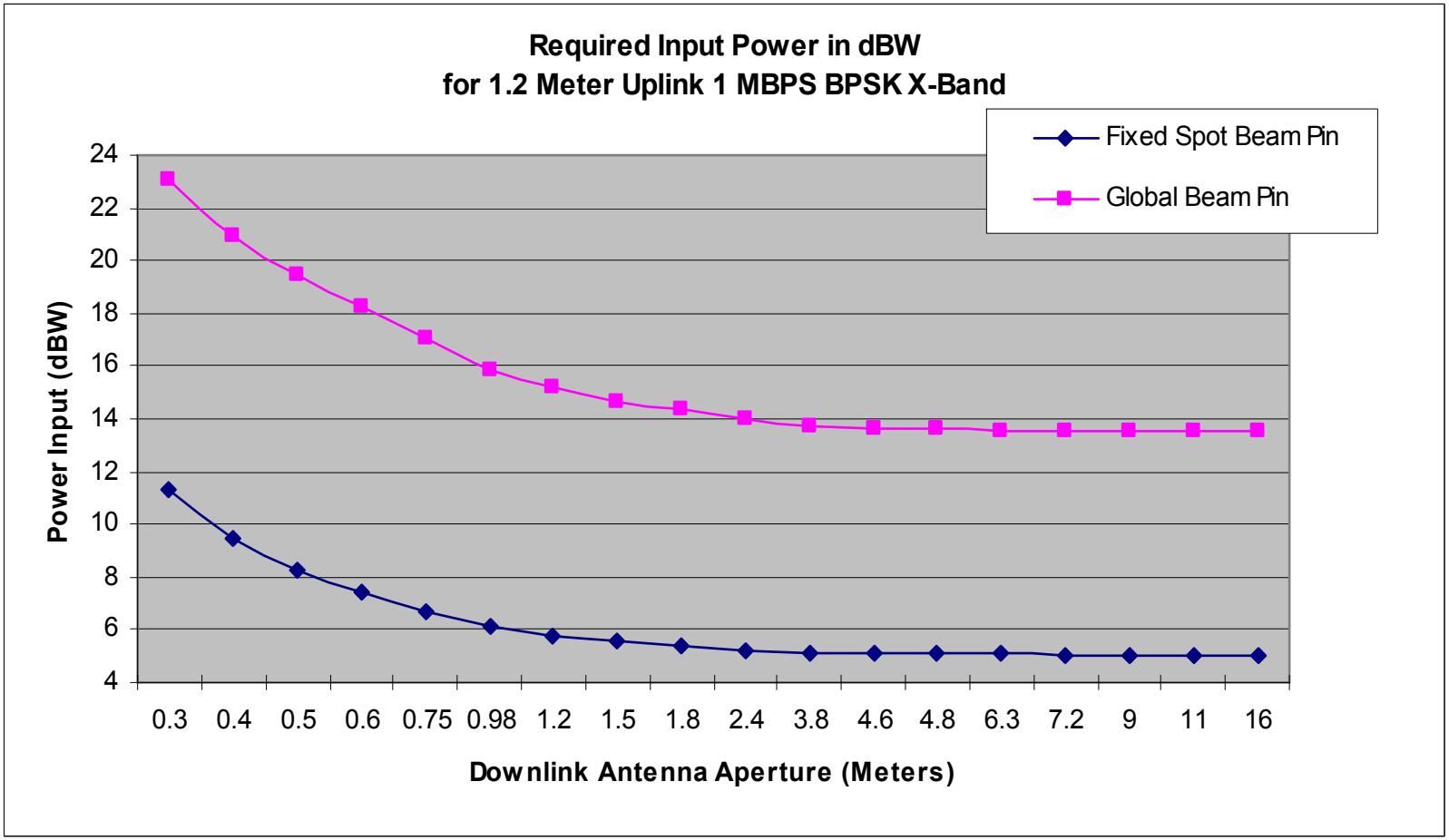
Power and bandwidth can be traded like other satcom

- Larger antennas take less power and can run higher modulation orders
- Smaller antennas must be carefully controlled to prevent interference

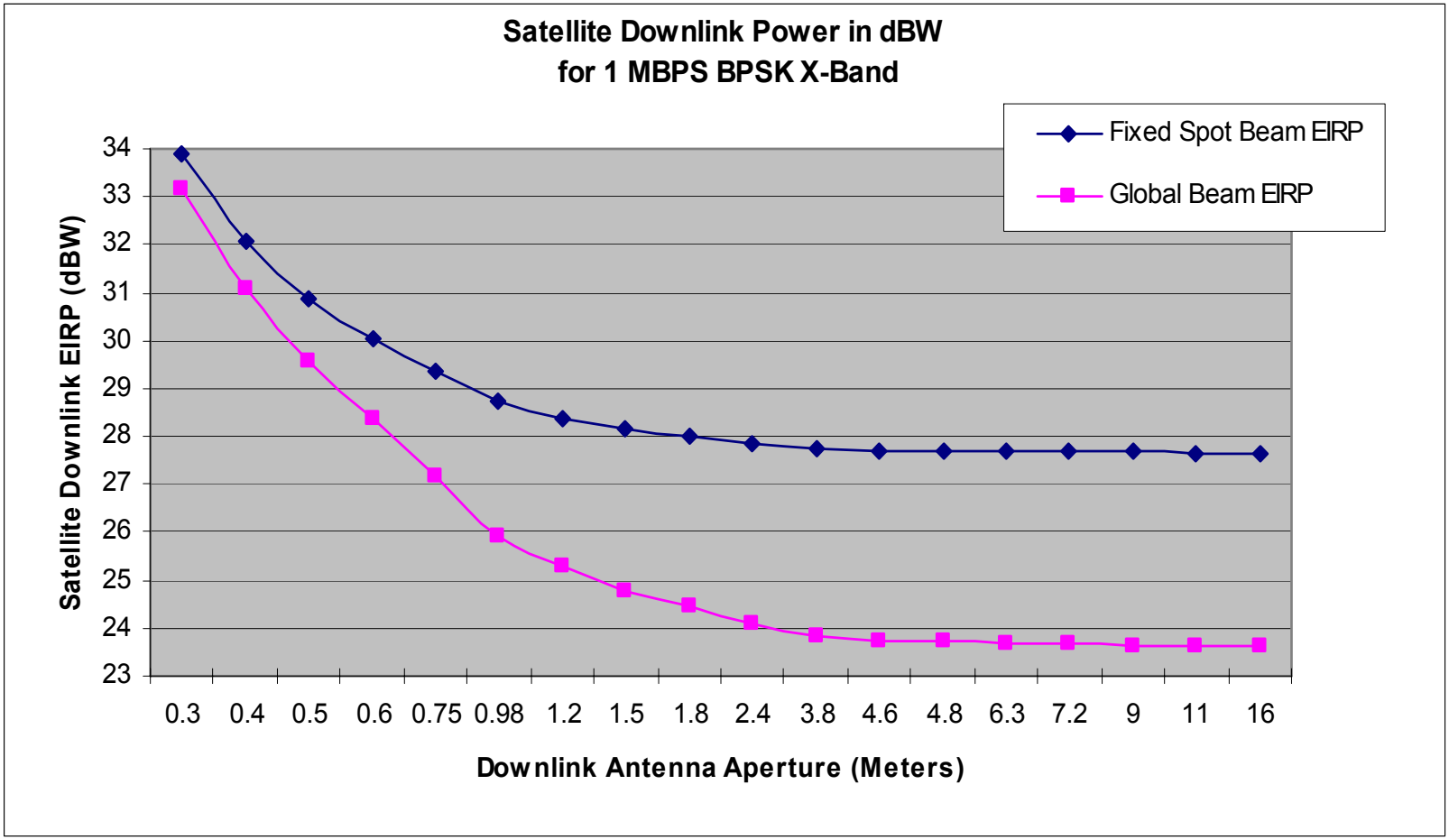
Power requirements can be graphically displayed

- The following graphs show uplink and downlink power
- These charts are “normalized” for 1 MBPS operation
- Two different beams (global and spot beam) on XTAR satellites illustrated
  - Represents among the most recent generation of X-Band transponders

Example X-Band Uplink Input Power



Example X-Band Downlink EIRP



X-Band Example Link Analyses

SOTM™ link analyses permit us to calculate requirements

- Just as in Ku-Band case, but different terminal and space segment options
- Smaller terminals have advantages and disadvantages

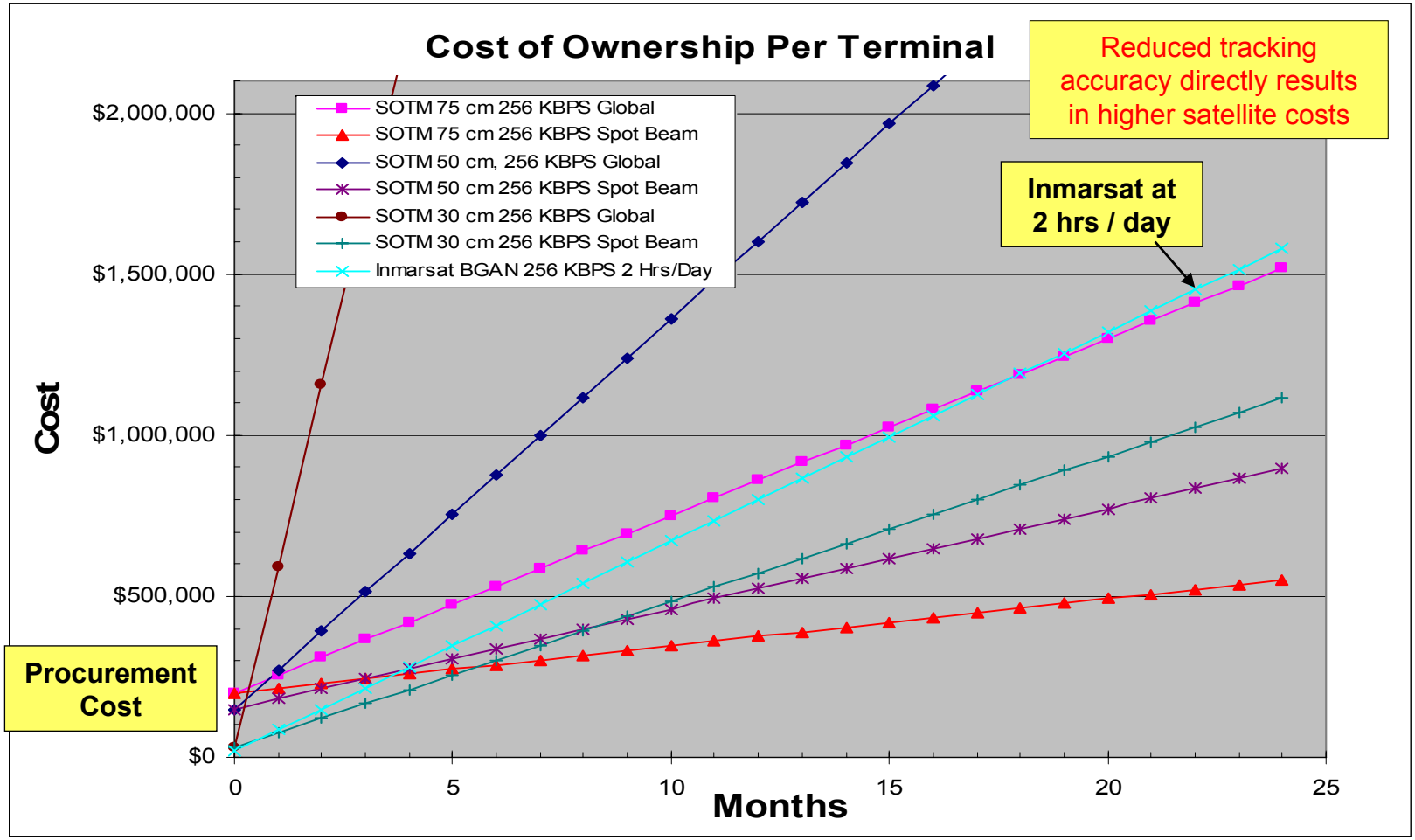
Transponder costs are dominant

- At X-Band this is often more confused due to lack of accounting
- Multiple agencies or entities often share system cost allocations

Life Cycle Costs must be considered for network operation

- This is true for all of satcom, but may be more significant here
- Some operational requirements can best be met here
- SOTM™ can provide cost-effective service from anywhere!
  - If properly designed and engineered

Example X-Band Cost Of Ownership



Example X-Band Cost Of Ownership Parameters

Inmarsat 256 KBPS shown for comparison

- Only 2 hours / day for this example -- $18.07 / Minute

X-Band transponder costs included

- Cost of $2,000 / MHz / month included as an example
  - Every one is different
- All X-Band examples are full period – continuous 24 hrs / day

Global beam and Spot beams show difference in performance

- Global beam not well-suited to SOTM™ operation
- Spot beams can support cost-effective SOTM™ operation
- Spot beam type performance only achievable on state-of-the-art satellites

Every SOTM™ case at X-Band needs separate engineering

- Not nominal from one satellite to the next
- Not nominal from one satellite beam to the next
- X-Band satellites often have configurable beam coverage
- All cases show nominal ROM procurement estimates – not a major factor in cost
  - It is easy to see that transponder costs are dominant

Alternative Use of Space Segment

Alternate uses of transponder should be considered

- Factors in to opportunity cost of SOTM™ operation
- SOTM™ cost stands on its own, but satellite capacity is not unlimited
- Obviously, most critical in situations with limited satellite capacity

For the cases shown in figure, alternative use could support:

SOTM Operation	Alternative using 9 Meter antenna global beam	Alternative using 9 Meter antenna spot beam
75 cm 256 KBPS	643 KBPS	360 KBPS
50 cm 256 KBPS	908 KBPS	455 KBPS
30 cm 256 KBPS	5731 KBPS	1615 KBPS

Conclusion

FSS Ku-Band Can Provide Broadband On-The-Move Now!

- Technology is effective
- Terminals can be licensed now – final regulations expected very soon
- Current technology is suitable for operation worldwide
- Terminal technology can be optimized to meet user needs

The Same Approach Is Applicable to X-Band

- X-Band SOTM™ takes more engineering, but it is viable
- Each satellite beam must be considered separately

Several applications well-suited to SOTM™

- Different size antennas can meet different operational requirements
- Terminal cost can be optimized
- Existing modems pose no interference risk to adjacent satellites
- Existing “bent pipe” transponders can provide cost-effective service